

Claims

1. An automatic parking brake, including a brake piston (2), an auxiliary piston (3), a hydraulic chamber (4) disposed between the brake piston (2) and the auxiliary piston (3), a spring element (7), for prestressing the auxiliary piston (3), a spindle device (5) connected to the auxiliary piston (3) via a threaded connection (6), and a drive (13) for the spindle device (5), wherein in a locked state of the parking brake, the brake piston (2) is mechanically locked via the spindle device (5) and the spring-loaded auxiliary piston (3), and in a released state of the parking brake, the auxiliary piston (3) is blocked by means of the spring element (7) and/or by means of the spindle device.
2. The parking brake in accordance with claim 1, characterized in that the drive (13) is an electric motor.
3. The parking brake in accordance with claim 2, characterized by a diagnosis device (14) for determining a locked and/or released state of the parking brake, in which the diagnosis device determines the state of the parking brake on the basis of a motor current consumed by the electric motor.
4. The parking brake in accordance with claim 2 or 3, characterized by a detection device, for ascertaining a blocking current of the electric motor before each locking operation and/or before each release operation.

5. The parking brake in accordance with one of the foregoing claims, characterized in that wear of a brake lining can be compensated for by a lengthened stroke of the spindle device (5).
6. The parking brake in accordance with one of the foregoing claims, characterized in that the spindle device (5) is disposed in an air-filled chamber (12).
7. The parking brake in accordance with one of the foregoing claims, characterized in that a sealing element (8) on the brake piston (2) for sealing off the hydraulic chamber (4) is also embodied as a restoring element for the brake piston (2).
8. The parking brake in accordance with one of the foregoing claims, characterized by a device (15; 19) for preventing seizing of the spindle device (5).
9. The parking brake in accordance with claim 8, characterized in that the device for preventing seizing of the spindle device (5) includes both an element (16) that protrudes from a head of the spindle device (5) and an elastic element (17).
10. The parking brake in accordance with claim 9, characterized in that the elastic element (17) is a spring or an elastomer.
11. The parking brake in accordance with claim 9 or 10, characterized in that the protruding element (16) is a ball.

12. The parking brake in accordance with claim 8, characterized in that the device (19) for preventing seizing of the spindle device (5) is a stop, and the stop includes a first element (20), which is disposed on the head of the spindle device (5), and a second element (21), which is disposed on a housing part (11), and in a stop position, the first element (20) is in contact with a stop face perpendicular to a direction of rotation of the spindle device (5).

13. The parking brake in accordance with claim 12, characterized in that a height of the second element (21) on the head of the spindle device (5) is less than one thread pitch of the spindle device (5).

14. A method for actuating an automatic parking brake (1), having a brake piston (2) and a spring-loaded auxiliary piston (3) that is connected to a spindle device (5) via a threaded connection (6), including the following steps:

- actuating the spindle device (5), until the spindle device (5) contacts the brake piston (2);

- building up a hydraulic pressure in a hydraulic chamber (4) disposed between the brake piston (2) and the auxiliary piston (3), when the spindle device (5) contacts the brake piston, in order by means of the brake piston (2) to shift the parking brake into a locked state, and in order to move the auxiliary piston (3), connected to the spindle device (5), in an opposite direction (2), whereupon the spindle device (5) is spaced apart from the brake piston (2);

- actuating the spindle device (5) again, until the spindle device (5) again contacts the brake piston (2) and the position of the brake piston (2) is mechanically fixed via the spindle device (5) and the auxiliary piston (3); and

- reducing the hydraulic pressure in the hydraulic chamber.

15. The method in accordance with claim 14, characterized in that the auxiliary piston (3) is acted upon by the spring force of the spring element (7), in order to keep the brake piston (2) in its locked position.

16. The method in accordance with claim 14 or 15, characterized in that the spindle device (5) is driven by means of an electric motor (13), and a diagnosis of the state of the parking brake (1) is made on the basis of a motor current consumed by the electric motor (13), by means of a diagnosis device (14).

17. The method in accordance with one of claims 14 through 16, characterized in that before a locking and/or release of the parking brake (1), the spindle device (5) is moved toward a component in a direction counter to the actuation direction of the spindle device (5) in order to determine a magnitude of a blocking current of the electric motor (13).

18. The method in accordance with one of claims 14 through 17, characterized in that for releasing the locked parking brake (1), a hydraulic pressure in the hydraulic chamber (4) is built up; the spindle device (5) is actuated in order to move it away from the brake piston (2), and the spindle device (5) does not rotate until a pressure in the hydraulic chamber (4) is equal to or greater than a spring force of the spring element (7), and the spindle device (5) is moved until it comes into contact with a housing part (11) and after the spindle device (5) contacts the housing part (11), the hydraulic pressure in the hydraulic chamber (4) is reduced, as a result of which the brake piston (2) and the auxiliary piston (3) move in the direction toward one another, so that the spindle device (5) connected to the auxiliary piston (3) via the threaded connection (6) comes out of contact with the housing part (11).

19. The method in accordance with one of claims 14 through 18, characterized in that after the reduction of the hydraulic pressure, the spindle device (5) is driven again, until it once again comes into contact with the housing part (11), in order to assure a mechanical fixation of the auxiliary piston (3) in the released state of the parking brake.